

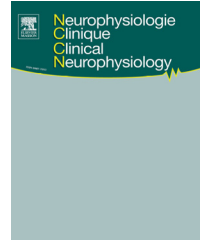


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ORIGINAL ARTICLE/ARTICLE ORIGINAL

Transcranial magnetic stimulation identifies cortical excitability changes in monosymptomatic nocturnal enuresis



La stimulation magnétique transcrânienne identifie des modifications d'excitabilité corticale dans l'énurésie nocturne

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KEYWORDS

Nocturnal enuresis;
Cortical excitability;
Resting and active
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Cortical silent period;
Transcallosal
inhibition

Summary

Objectives. – A limited number of electroencephalography (EEG) studies in nocturnal enuresis (NE) have reported cortical dysmaturity. The aim of the present study was to test this notion by examining cortical excitability in subjects with nocturnal enuresis (NE) using transcranial magnetic stimulation (TMS).

Material and methods. – We investigated 41 patients with NE meeting the DSM-IV diagnostic criteria for NE, and 18 age- and sex-matched controls. Each subject was assessed clinically regarding frequency, duration of enuresis and Health Survey Measurement. Neurophysiological measures included resting and active motor thresholds (RMT, AMT), motor evoked potentials (MEP) of upper and lower limbs, cortical silent period duration (CSP) and transcallosal inhibition (TCI), in the upper limbs.

Results. – Patients had a significantly lower Health Survey Measurement score for both physical and mental health components compared to the control group. RMT and AMT of both upper and lower limbs as well as the duration of the CSP and TCI were significantly reduced compared with the control group. There was significant positive correlation between RMT, AMT and Health Survey Measurement scores, especially Social Functioning.

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MOTS CLÉS

Énurésie nocturne ;
Excitabilité
corticale ;
Seuil moteur au repos
et sous activation ;
Période de silence
corticale ;
Inhibition
transcalleuse

Conclusion. – Patients with nocturnal enuresis are characterized by pathologically increased excitability and reduced inhibitory processing in the motor cortex, which could contribute to the pathogenesis of nocturnal enuresis.

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Résumé

But de l'étude. – Quelques études EEG ont fait état d'une dysmaturité corticale chez les patients atteints d'énurésie nocturne (EN). Notre étude vise à évaluer cette hypothèse en mesurant, au moyen de la stimulation magnétique transcrânienne (SMT) l'excitabilité corticale de patients présentant une EN.

Matériel et méthodes. – Notre étude a porté sur 41 patients remplissant les critères DSM-IV d'EN et sur 18 contrôles appariés par le sexe et l'âge. Chaque patient a été évalué cliniquement : fréquence et durée de l'énurésie, Health Survey Measurement (HSM). Sur le plan neurophysiologique, nous avons mesuré les seuils moteurs au repos (SMR) et sous activation volontaire (SMA), les potentiels évoqués moteurs (PEM) des membres supérieurs et inférieurs, la durée de la période de silence corticale (PSC) et l'inhibition transcalleuse (ITC) au niveau des membres supérieurs.

Résultats. – Par rapport aux contrôles, les patients présentaient un score HSM significativement inférieur aussi bien pour la santé physique que mentale. Les SMR et SMA des membres supérieurs et inférieurs, la durée de la PSC et l'ITC étaient également significativement inférieurs chez les patients par rapport aux contrôles. Une corrélation significative fut trouvée entre les SMR et SMA, d'une part, le score HSM, d'autre part, en particulier le fonctionnement social.

Conclusion. – Les patients présentant une EN présentent une augmentation pathologique d'excitabilité du cortex moteur et une diminution des processus d'inhibition de celui-ci, qui peuvent contribuer à la pathogenèse de l'EN.

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Introduction

Nocturnal enuresis (NE) or bedwetting is defined as the involuntary voiding of urine in bed beyond the age at which bladder control is normally expected [10]. Bedwetting is a widespread and distressing condition that can have a deep impact on a child or young person's behavior, emotional well-being and social life. It is also very stressful for the parents or carers [4]. Monosymptomatic nocturnal enuresis (MNE) describes bedwetting in children with no daytime urinary symptoms to suggest underlying voiding dysfunction.

The etiology of NE is not fully understood. It seems to be multifactorial and several explanations have been put forward to explain this phenomenon, including genetic influences, difficulties in waking, decreased night-time secretion of antidiuretic hormone, and stress and psychological factors [8,13]. A possible explanation is that this is related to a deficiency of inhibitory signal processing in the brainstem that accounts for the inability to inhibit detrusor activity and micturition during sleep [5,14]. Based on functional and structural abnormalities in some brain areas, it has been recently proposed that enuresis represents delayed functional maturation of the central nervous system (CNS) in this multifactorial model [21]. Indeed, Lei et al. [12] found microstructural abnormalities in the thalamus, the medial frontal gyrus, the anterior cingulate cortex (ACC) and the insula of the children with primary MNE using diffusion tensor imaging. A limited number of electroencephalographic (EEG) studies have also been performed to clarify the relationship between nocturnal enuresis and selective cortical dysmaturity [9,15,20]. In a child with primary MNE, Toros

et al. [19] reported an increased hyperventilation (HV) response, which is commonly considered to be a sign of brain damage, dysfunction or instability of the cerebral cortex as a result of delayed maturation [9,11].

We therefore speculate that the structure of the brain is likely to be abnormal in MNE patients. However, the exact cerebral areas involved in the pathogenesis of MNE remain unclear. Therefore, as a further step towards understanding this condition we evaluated changes in motor cortical excitability of children with MNE using transcranial magnetic stimulation.

Materials and methods**Subjects**

This study was conducted in the Neuropsychiatry department, Assiut University Hospital from May 2013 to May 2014. All subjects were diagnosed as patients with primary monosymptomatic nocturnal enuresis according to the Diagnostic and statistical manual of mental disorders, 4th edition (DSM-IV) [1]: repeated urination into bed or clothes, occurring twice per week for at least three consecutive months in a child of at least 5 years of age and not due to either a drug side effect or a medical condition. All patients had been taking the tricyclic antidepressant drug Imipramine (25 mg once/day) for at least 3 months without satisfactory results. The study included two groups. The experimental group consisted of 41 nocturnal enuresis patients (28 females), with a mean age of 13.8 ± 3.7 years (range 8–22 years), and control group of 18 age-matched healthy volunteers

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